

REMARKS

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Thus, Claim 5 has been amended to incorporate the subject matter of Claim 6, as a result of which Claim 6 has been cancelled.

In view of the cancellation of Claim 6, Claim 8 has been amended to depend from Claim 5.

Referring to the Examiner's comments concerning allowable subject matter on page 4 of the Office Action, indicating that Claims 6 and 8 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, it is apparent that in view of the amendments to Claims 5 and 8, these claims should now be allowed.

New Claims 9 and 10 have been added to the application. Claim 9 corresponds to a combination of Claims 5 and 7, i.e. Claim 7 in independent form. Claim 10 corresponds to Claim 6, but is dependent on Claim 9.

The patentability of the subject matter of Claims 9 and 10 over the disclosures of the references relied upon by the Examiner in rejecting the claims, will be apparent upon consideration of the following remarks.

Initially, the rejection of Claim 5 under 35 U.S.C. § 103(a) as being unpatentable over Douglas in view of Yu has been rendered moot. That is, as indicated above, new Claim 9 corresponds to Claim 7 in independent form, and Claim 7 is not subject to this rejection.

The rejection of Claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Douglas in view of Yu and further in view of Nguyen et al. is respectfully traversed.

The features of the present invention as recited in Claim 9 are (1) etching a metallic surface of copper, silver, gold, or an alloy thereof, (2) using an etching gas containing gaseous nitrogen oxide and ammonia, and (3) a mask material of titanium or a titanium alloy.

In describing the reference disclosures, the Examiner takes the position that one skilled in the art would have found it obvious to substitute Douglas's titanium layer with

copper in view of Yu, and would have found it obvious to modify Douglas and Yu by using titanium material as a mask.

However, in Douglas, the material to be etched is a titanium material. That is, in describing the Douglas disclosure, the Examiner refers to layer 34, which according to column 4, lines 29-30 of this reference, contains titanium nitride. [Column 2, lines 45-48 also indicates that the material to be etched is titanium nitride.] Douglas also states that the masking material (silicon dioxide in Douglas) serves to protect the covered portion of layer 34 from subsequent etching (column 4, lines 48-49). Contrary to the position taken by the Examiner, one skilled in the art would not use titanium material as a mask in the process of Douglas, since the titanium material mask would be etched, i.e. would not protect the covered portion of layer 34 (which itself is a titanium material to be etched) from subsequent etching.

Furthermore, although the Examiner states that Douglas describes an etchant containing dry etch reactants of nitrogen oxide and ammonia (the Examiner refers to column 8, lines 9-29 of Douglas, but perhaps the Examiner meant column 5, lines 9-29), the etchant of Douglas does not contain both nitrogen oxide and ammonia, as required in the presently claimed invention. That is, referring to column 5, lines 5-54 of Douglas, the etchant contains an oxidizing or reducing agent (column 5, lines 11, 34-35 and 46-48). The oxidizing agent can be nitrogen dioxide, and the reducing agent can be ammonia (column 5, lines 24-28), but the etchant will not contain both an oxidizing agent and a reducing agent. This is confirmed by the examples of the etchant given in Douglas at column 5, lines 39-43, all of which contain either an oxidizing agent (O₂) or a reducing agent (H₂ or HCl) but do not contain both an oxidizing agent and a reducing agent.

In summary, the references applied by the Examiner in rejecting the claims do not suggest a combination of claimed features (1), (2) and (3) of the present invention as discussed above, particularly with regard to the mask material (titanium or a titanium alloy) and the etching gas (nitrogen oxide and ammonia) employed in the present invention. Applicant places particular emphasis on the fact that, according to the references, if a titanium material mask were used in the etching process of Douglas as suggested by the Examiner, the mask would fail to perform its protective function, since

as stated in the Douglas reference, the etching gas used therein would etch a titanium material.

For these reasons, Applicant takes the position that the presently claimed invention is clearly patentable over the applied references.

Therefore, in view of the forgoing amendments and remarks, it is submitted that each of the grounds of rejection and objection set forth by the Examiner has been overcome, and that the application is in condition for allowance. Such allowance is solicited.

Respectfully submitted,

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